

A Q U A P H Y T E

A NEWSLETTER ABOUT AQUATIC, WETLAND AND INVASIVE PLANTS

Center for Aquatic and Invasive Plants

with support from

The Florida Department of Environmental Protection,
Bureau of Invasive Plant Management
The St. Johns River Water Management District



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APIRS Database

Aquatic Plant Information Retrieval System

<http://plants.ifas.ufl.edu/APIRS>

The **Aquatic Plant Information Retrieval System (APIRS)**, now with more than 67,000 bibliographic citations, continues to be the largest free database of its kind in the world. Used regularly by researchers, government agencies, companies, teachers, students and private groups and individuals, users can request searches of the database or they can access the database themselves online. **APIRS** is supported by the Florida Department of Environmental Protection, Bureau of Invasive Plant Management.

The **APIRS** database was moved to a new system programmed by a senior computer science student at the University of Florida, Mr. Dmytro Martynyuk. The system now runs on MySQL with php as an interface, allowing for greater flexibility and stability than before.

Features of the new system include an optional Log In that enables users to tag and email citations, a date modifier field, faster data entry, online editing capabilities, and a far less expensive system to maintain.

To tag and email citations, users simply login before searching the database (nothing is required except a password and an email address). Any citations of interest may then be selected and sent to Tag Records, where you may accumulate or delete citations before sending them to your own email address. See Tagging Help under Search Strategies for more information (only available when you log in).

Note: Logging in is not required in order to search the **APIRS** database. It is only required for tagging citations.

Search operators for the **APIRS** database have changed and are listed below:

Search All Fields

- *** = Truncation operator.** An asterisk (*) appended to a word will find that word plus any additional letters; for example: sediment* will return records on sediments, sedimentation, sedimentary, etc.

- **+ = AND Operator.** A leading plus sign (+) indicates that the word or words *must be present* in each citation that is returned. There is no space between the operator and the search term; for example, +hydrilla +smith

- **- = NOT Operator.** A leading minus sign (-) indicates that the word *must not be present* in any of the citations that are returned; for example, smith* -hydrilla will return citations containing smith, but not those containing hydrilla.

- **= OR operator.** When neither + nor - is specified, the default is OR; for example, smith* hydrilla* returns citations that contain *either word*.

- **" " = Exact phrase operator.** A phrase that is enclosed within quotation marks matches only citations that contain the exact phrase; for example, "chemical control"

- **() = Subexpression operator.** Parentheses group words into subexpressions; these can be nested. For example: +acid +(rain* precip* depositi*) finds acid rain or acid precipitation or acid-deposition.

- To restrict your search results by date, choose one of the modifiers from the **Date modifier** field (<, >, =), and enter a date, combined with your search term in **Search All Fields**.

- To search for a single publication year, enter the year into the **Date** field under the list of individual fields (see below).

- **+hydrilla smith** finds citations that contain the word "hydrilla", but ranks citations higher if they also contain "smith".

- **+ - = BUT NOT operator.** +wetland -construct* finds citations that contain "wetland" but not "constructed wetlands".

Search Individual Fields

To search a specific field (for example, **Title**, **Author**, **Date**, etc.), type a single word into an individual field. Individual field searches *do not support* the above listed operators, multiple search terms, or multiple fields; use a single word in a single field only (for example: Vallisneria in the **Title** field).

Advanced Search Examples

Following are examples of advanced search strings for searching the **APIRS** database. These have been compiled based on many years of experience using the database. Search examples are in **bold**:

- For acid rain, use the following keywords to be sure you are not missing the publications that refer to acid rain as acid precipitation or acid deposition: +acid +(rain* precip* depositi*)

- For carbon-14, search: ("c-14" "c14" "14-c" "14c" "carbon-14" radio* radio-label*) (+carbon* +isotop*)

Continued on page 6

Aquatic Plant Videos Now on DVD

The Aquatic Plant Identification Series, previously available in VHS and PAL formats, has been reformatted to a four-disc DVD set. The series was created for the benefit of aquatic plant managers, regulators, students and the general public. Narrated by Dr. Kenneth Langeland of the University of Florida/IFAS Center for Aquatic and Invasive Plants, each segment is 2-3 minutes in length and uses everyday language to identify 115 aquatic plants that grow in Florida and similar geographic locations.

The series features identification segments on floating and floating-leaved plants, emersed plants, submersed plants, and aquatic and wetland grasses, sedges and rushes.

The plant species depicted in the identification series are listed on the CAIP website at: <http://plants.ifas.ufl.edu/idlist.html>

DVD 084 - \$35.00

To order these programs, contact:

University of Florida, IFAS Publications

www.ifasbooks.ufl.edu

1-800-226-1764 (toll free in the USA)

VHS and PAL formats are available until supplies are depleted.



The Aquatic Plant Management Series, previously available as five separate video programs, is now available as a two-disc DVD set.

Included are the following programs:

Aquatic Pest Control Applicator Training -

Parts I & II teach the basic knowledge necessary to be certified as a restricted use pesticide applicator in aquatic pest control (category 6) in Florida. Topics covered include a brief history of aquatic plant management, laws, herbicide technology, biological control, mechanical control and environmental effects.

Calibration—A Field Approach presents a practical approach to calibrating handguns, booms and granular spreaders.

How to Determine Areas and Amount of Aquatic Herbicide to Use reviews some of the mathematics essential to the proper use and application of aquatic herbicides.

Maintenance Control of Aquatic Weeds - What it is Not! explains why regular management of aquatic weeds is the most environmentally sound and economical method of aquatic plant management.

DVD 085 - \$25.00

At the Center in 2007

by William T. Haller, Acting Director

Center for Aquatic and Invasive Plants

The **University of Florida/IFAS Center for Aquatic and Invasive Plants (CAIP)** was established by the Florida legislature in 1978 to provide coordination in the multidisciplinary area of aquatic weed management. Offices, laboratories and field support facilities were constructed at our current location 15 km northwest of the University of Florida main campus. Offices at the Center provide space for two Agronomy Department faculty members, the Center Director, the Information Office and supporting staff. A research scientist from the U.S. Corps of Engineers also is located at the CAIP. Cooperative studies are conducted in aquatic and invasive plant management with various UF faculty members both at the CAIP and at other IFAS locations.

The UF/IFAS faculty (research, extension and teaching) affiliated with the CAIP are in several academic departments. **Drs. William Overholt** (Agriculture Research & Education Center (AREC) in Fort Pierce, FL) and **James Cuda** (Entomology and Nematology Department) are conducting research on the classical biological control of hydrilla (*Hydrilla verticillata*) in East Africa, as well as on air potato (*Dioscorea* spp.) in West Africa and hygrophila (*Hygrophila polysperma*) in India. **Dr. Kenneth Langeland** (Agronomy Department) and his students and staff have been working on melaleuca (*Melaleuca quinquenervia*) and Old World climbing fern (*Lygodium microphyllum*), along with developing management programs for other invasive species. **Drs. Jay Ferrell** (Agronomy Department), **Brent Sellers** (AREC in Ona, FL), and **Curtis Rainbolt** (AREC in Belle Glade, FL) are studying invasive wetland grasses such as *Hymenachne*, *Hemarthria* and *Arundo* (giant reed). **Drs. Alison Fox** and **Randall Stocker** (Agronomy Department) continue work on the UF/IFAS *Assessment of the Status of Non-native Plants in Florida's Natural Areas* (<http://plants.ifas.ufl.edu/assessment/>). These are just some of the diverse projects in progress by only a few of the UF faculty members devoting efforts toward invasive plant management.

The area of public education (Extension) is receiving more effort than in past years due to a major cooperative effort with the Florida Department of Environmental Protection, Bureau of Invasive Plant Management. CAIP staff are working with teachers to develop curricula, including hands-on classroom activities, interactive web programs, and laboratory modules. The first annual **Summer Invasive Plant Workshop** for Florida science teachers took place in June 2007 and plans are already underway for 2008. Site specific educational materials also are being developed for participating state parks.

The annual **Aquatic Weed Control Short Course** hosted over 450 attendees in Coral Springs, Florida in May 2006 and a new northwest **Florida Right-of-Way and Aquatic Pesticide Applicator Training Course** will be held in Panama City in October 2007.

Studies by graduate students include the taxonomy and management of *Cabomba* species, management of *Lygodium* species, and data collection for future registration of flumioxazin for aquatic weed control. Faculty affiliated with the CAIP have students working on the ecology of *Ardisia*, biological control of *Hygrophila*, and taxonomy and disease susceptibility of cogongrass accessions.

Post-doctoral work has **Dr. Atul Puri** (pictured at right) studying the effects of aquatic herbicides on non-target species, potential resistance to ALS herbicides by hydrilla and *Lygodium*, developing Best Management Practices for



Dr. Atul Puri

Nymphoides and *Rotala* control, and evaluating new herbicides with different modes of action for possible hydrilla control. **Dr. Lynn Gettys** is looking at the parameters affecting the establishment of native submersed species, primarily *Vallisneria*, and the food habits and plant consumption rates of exotic island channeled apple snails (*Pomacea insularum*).

Quality education of undergraduate and graduate students is a priority of University of Florida faculty members. Graduate programs in the area of invasive plants are underway in many disciplines at UF such as Forestry, Agronomy, Horticulture, Entomology and other UF academic units (Botany, Engineering, Landscape Architecture, Law, etc.) Visit the College of Agricultural and Life Sciences (CALS) website for graduate and undergraduate departments and schools (<http://cals.ufl.edu/>), and the main UF website (www.ufl.edu) for entrance requirements.



Dr. William Haller takes Florida science teachers on an aquatic plant field trip as part of the first annual Summer Invasive Plant Workshop.

BOOKS/REPORTS, ETC.

A NATURAL HISTORY OF FERNS

By R.C. Moran. 2004. 301 pp. ISBN 0-88192-667-1. \$29.95 U.S. Timber Press, Portland, OR. www.timberpress.com or uk@timberpress.com

Mr. Moran is curator of ferns at the New York Botanical Garden and the author of four other books about ferns. This book is organized into six categories: The Life Cycle of Ferns; Classification of Ferns; Fern Fossils; Adaptations by Ferns; Fern Geography, and Ferns and People. Aquatic genera include *Azolla*, *Ceratopteris*, *Equisetum*, *Isoetes*, *Lygodium*, *Marsilea*, *Salvinia* (with the chapter title, The Molesting *Salvinia*), and others. The book is full of wonderful natural history, such as the quote from 19th century botanical explorer Richard Spruce who, upon sighting a stand of giant horsetails (*Equisetum*) in Ecuador in the early 1860s exclaimed, "the most remarkable plant in the forest of Canelos is a gigantic *Equisetum*, 20 feet high, and the stem nearly as thick as the wrist!...It extends for a distance of a mile on a plain bordering the Pastasa [Pastaza River] but elevated some 200 feet above it, where at every few steps one sinks over the knees in black, white, and red mud." There are literary references from Shakespeare to Daniel Defoe's *Robinson Crusoe*. Contains many excellent drawings and some photographs; B&W.

THE LOTUS: KNOW IT AND GROW IT

By Kelly Billing and Paula Biles. 2007. 48 pp. ISBN 978-0-9794732-0-3. International Waterlily & Water Gardening Society (IWGS). www.iwgs.org. \$14. U.S., plus shipping/handling.

This booklet holds information on almost everything about lotus: cultivation, ornamental and other uses, cultural traditions, lore, a guide for growers, and resources for additional information. The full-color booklet has more than 100 beautiful photographs and is a handy guide even for those unfamiliar with *Nelumbo*.

THE WATER LILY CROSS

An English Garden Mystery by Anthony Eglin. 2007. 294 pp. ISBN-13: 978-0-312-36546-2. Thomas Dunne Books. www.thomasdunnebooks.com; St. Martin's Minotaur, New York. \$23.95 U.S.

Lawrence Kingston, retired professor of botany, *bon vivant*, and would-be sleuth, searches for a colleague who has mysteriously gone missing after stumbling upon an aquatic horticultural breakthrough with staggering world-wide implications.

A MONOGRAPH OF NUPHAR (NYMPHAEACEAE)

By Donald J. Padgett. 2007. *Rhodora* 109(937):1-95. The New England Botanical Club.

"The genus *Nuphar* (Nymphaeaceae) is described to include 11 species native to fresh waters of the Northern Hemisphere."

WOODLAND CAREX OF THE UPPER MIDWEST

By Linda Curtis. 2006. 171 pp. Curtis to the Third Productions, Lake Villa, IL. www.curtistothethird.com \$19.95, plus S/H.

"Over 100 species of *Carex* grow in wet to dry habitats in the upper Midwest but this book includes only the 63 species in the herb layer of woodlands, forests, swampy woods, river and lake woods, and thickets."

PLANTED AQUARIUMS: CREATION AND MAINTENANCE

By Christel Kasselmann. 2005. 160 pp. ISBN 1-57524-209-9. Krieger Publ., Melbourne, Florida. www.krieger-publishing.com \$33.50.

"... a detailed, well illustrated, informative book on the art and science of keeping planted aquaria. Every aspect is covered, from lighting to water, substrates, and of course, plants, all bound up in a sleek, 158-page full-color hardcover book... **Planted Aquariums** presents all of the information a budding or intermediate aquatic gardener needs to be successful." (excerpt from *The Aquatic Gardener*, 18(4):35, 43. 2005.)

PAROLES DES MARAIS ATLANTIQUES - LA GESTION DES ESPECES EXOTIQUES ENVAHISSANTES EN ZONES HUMIDES

Edited by Loic Anras, Gilbert Miossec et Alain Gallice. 2005. 258 pp. ISSN 1624-7450. *Aestuarina*, No. 6. www.forum-marais-atl.com €30. IN FRENCH.

This publication covers the status of exotic invasive species, both plant and animal, and their management and control in the wetlands and marshes of France.

WETLAND DRAINAGE, RESTORATION, AND REPAIR

by T.R. Biebighauser. 2007. 236 pp. ISBN 978-0-8131-2447-6. University Press of Kentucky, Lexington. www.kentuckypress.com \$50.00.

The author draws from his own experience in building more than 950 wetlands in 10 states in the U.S. and one Canadian province. He now teaches hands-on wetland restoration workshops across North America, and works with those who have built wetlands that failed. The book includes a historical overview of wetland destruction and repair over the past two hundred years. Suitable for professionals as well as private landowners interested in the process of wetland restoration or creation. Abundantly illustrated with color photographs.

PITCHER PLANTS OF THE AMERICAS

by Stewart McPherson. 2007. 320 pp. ISBN 0-939923-74-2. McDonald & Woodward Publishing Co., Blacksburg, Virginia. www.mwpubco.com \$34.95.

Copious high quality color photographs and expert line drawings complement this description of pitcher plants in the Americas. Genera covered are *Darlingtonia*, *Heliamphora*, *Sarracenia*, *Brocchinia* and *Catopsis*.

ECOLOGY AND MANAGEMENT OF GIANT HOGWEED (*HERACLEUM MANTEGAZZIANUM*)

Edited by P. Pysek, M.J.W. Cock, W. Nentwig, and H.P. Ravn. 2007. 352 pp. ISBN 978-1-84593-206-0. CABI, Wallingford, UK. www.cabi.org \$120. US, €100.

The culmination of a three-year European Union project involving 40 European experts. An unusual note of interest included is that the musical group, Genesis, wrote a song in 1971 called The Return of the Giant Hogweed, which includes a bit of botanical history and the words, "Soon they escaped, spreading their seed..."

AQUATIC ECOLOGY AND SOCIETY OF RUIDERA LAKES (CENTRAL SPAIN) (ECOLOGÍA ACUÁTICA Y SOCIEDAD DE LAS LAGUNAS DE RUIDERA).

Álvarez Cobelas, M., Cirujano, S., editors. 2007. 414 pp. ISBN 978-84-00-08522-3. Biblioteca de Ciencias, 28. Consejo Superior de Investigaciones Científicas, Madrid. (In Spanish; English Summary)

This introductory book describes the Ruidera lakes, made up of a chain of lake basins in Campo de Montiel in Central Spain. The lakes depend on groundwater and surface drainage for their water. Similar lake districts occur in Plitvice (Croatia), Land'o'Lakes (Wisconsin), the Adirondack mountains (New York) and the northwest region of Florida (Tallahassee). Human activities have dramatically altered the environmental quality of the Ruidera lakes.

Forty-five aquatic macrophytes are listed in the chapter devoted to this topic, nine of which are Charophytes.

BAIRA: THE FLOATING GARDENS FOR SUSTAINABLE LIVELIHOOD

By Haseeb Md. Irfamullah, with contributions by Md. Belayet Hussain and T.I. Chowdhury, edited by A. Nishat and R. Ahmed, 2005. 61 pp. ISBN 984-8574-08-5. IUCN-The World Conservation Union, Bangladesh Country Office, Dhaka.

This intriguing book describes *bairas*, floating platforms made up of plant materials, used to cultivate crops or to raise seedlings within *gutis* (small containers made with aquatic plant material). Water hyacinth (*Eichhornia crassipes*) plants are the major component of these practical structures. Since the floodplains of southern Bangladesh are under water for three to four months per year, *bairas* are an effective method of creating small tracts of arable land. At the end of the wet season, *bairas* can be broken up and used for compost. This book was written as part of a project to provide alternative livelihood options to the people of Bangladesh.

NEW!

Invasive Plant "RECOGNITION" Tool

UF/IFAS experts have assembled these 3.75"x 6" laminated "recognition" cards to help professionals, students, and the general public learn to recognize 80 of the most common non-native and invasive plant species found throughout Florida. All of these plant species are currently targeted by the Florida Department of Environmental Protection for control in public waters and conservation lands around the state; twelve plant species are prohibited by state or federal law.

Each plant card features a full-color photograph on the front to help with visual recognition and information about the plant's overall appearance, leaves, flowers, fruit, ecological threat, and distribution. Alphabetized by scientific name, the cards are bound with a metal clasp ring that allows you to remove, add, or reorganize the cards to fit your needs.

This handy set is made up of 80 plant cards and 12 informational cards, including a glossary of plant terminology; plants by common and scientific names; a labeled set of illustrated plant parts; and bibliography.

A product of the Florida Invasive Plant Education Initiative.
Made possible by the Florida Department of Environmental Protection / Bureau of Invasive Plant Management.

UF UNIVERSITY of
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IFAS Extension
Center for Aquatic
and Invasive Plants

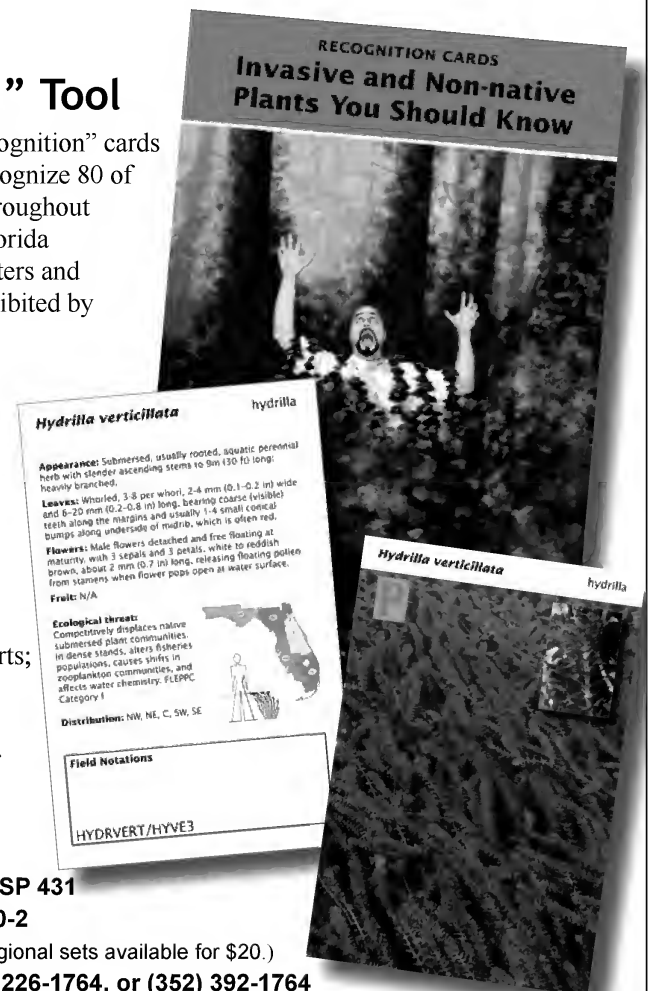


UF/IFAS Publication # SP 431

ISBN: 978-0-9797307-0-2

Full Set: \$35 (Smaller regional sets available for \$20.)

To order: (toll free) (800) 226-1764, or (352) 392-1764



Continued from page 1, APIRS Database Search Examples

- For revegetation/restoration, search:
(restor* reveg* transplant* reestabl* mitigat* reclaim* rec-lama* aquascap* recover*)
- For tissue culture, search:
microprop* "tissue culture" kane* cloning*
- For utilization, specify the type of use you are interested in and a plant name, if appropriate. Search:
+utilization +(drug* medicin* pharmac* ethnobot*)
or search: **+utilization +(biofertiliz* compost* mulch* ma-nur* fertilizer amend* enrich* organic*)**
or search: **+utilization +(food feed diet forage) +utilization +(bird duck ducks waterfowl)**
or search: **+utilization +animal***
- For herbicides in the environment, search the herbicide ge-neric name (*not* the trade name) (Ex: blammo)
+blammo +(persist* toxic* mobil* risk* degrad* bioaccum* residu* dissipa* bioconcen* fate biodegrad*)
If too many citations are retrieved, add the keyword "effects":
+blammo +effects +(persist* toxic* mobil* risk* degrad* bioaccum* residu* dissipa* bioconcen* fate biodegrad*)
- For control of plants, search
"chemical control" or "mechanical control" or "biological control" or "cultural control"
- For how to grow plants, search
grow* propaga* cultiva* horticu*
Add **hobby aquari*** for growing plants in tanks.
- For plants used in pollution control systems, search
"pollution control"
- For created or constructed wetlands, search:
+wetland*+(creat* construc* artific* manmade* man-made*)
- For the success or failure of these wetlands, combine the above search with:
(assess* success monitor* evaluat* failur* result* surviv* efficien*)
Note: Using * after **success** will retrieve many citations on plant succession.
- For erosion, search: **(erosion* erod* scouring*)**
- For erosion control, search:
"erosion control" "erosion control" "bank stabili*"
- For citations on invasions by exotic species, search:
(noxious* threat infest* obstruct* inva* spread* impact* exotic* non-indig* non-nativ* introduc*) economic* may also be used but this greatly increases the yield. To reduce either search, repeat the search with **"plant effects"**
- Regarding copper as an herbicide search:
+copper +("chemical control" herbicid*)
as a heavy metal or pollution, search:
+copper* +(metal* pollut* sediment* bioaccumu*)
or search **copper* -chemical***
- For seagrasses, use the genus names:
(zostera halodule enhalus posidonia syringodium amphibolis heterozostera thalassia halophila ruppia cymodocea phyllospadix)
Searching seagrass* with no genus name will retrieve fewer references.
- **APIRS** contains a small number of cites on mangroves. Use the genus names: **avicennia rhizophora laguncularia**
- For cites on aquatic soils or sediment, search:
+aquatic +(hydrosol* substrat* sediment*)

- For cites on models or systems, search:
system* stud* model* profil* predict* assess*
These keywords can be combined with categories such as lakes or wetland or rivers to make the search more specific:
+rivers +(system* stud* model* profil* predict* assess*)
- For citations on the effects of drought or flood or water level fluctuations, search:
+effects +(moist* saturat* flood* drought* level* inundat* wa-terlog* hydrolog* hydroperiod* fluctuat*)
- For cites on the benefits of aquatic plants, search:
benefi* valu* habitat* host* economic*
To limit the search, add **review** and/or scientific plant names:
+review* +(benefi* valu* habitat* host* economic*)
+hydrilla* +(benefi* valu* habitat* host* economic*)
- For cites on flowing water research, search:
flow flowing hydraulic* resist* velocit* manning* coeffici* friction*
(**Note:** searching **flow*** will retrieve a lot of citations on flowering.)
- For cites on growth or productivity of plants, search:
"growth rate" producti* competit* biomass* succession
- For cites on plants that kill or repel, search:
(phytochemical* phenolic* allelo* defens* toxic)
Note: Using * with **toxic** will retrieve citations on herbicide toxicology and toxicity.
- For cites on plant distribution, do not simply search distribu-tion. This word has been used to indicate the geographic location where research efforts took place. Search the plant name and:
(phytogeog* ("new record") occur* loca* flora range survey distrib* geograph* floristic* phytosociol*)
- For citations on evapotranspiration, search: **evapo***
This will retrieve citations with evaporation and evapotranspira-tion. Use **transpir*** for citations on transpiration.

Search for Yourself

Do you think **APIRS** has it all? Why not perform some self searching to find out. If you have a less-than-common surname, type it into the author field: **sculthorpe**

If you have a name like mine, Brown, combine it with some-thing unique, or close to unique, and enter it into the **Search All Fields** area: **+brown* +aquaphyte***

If you work on a specific plant species, or a particular area of study (micropropagation), or in a specific geographic region (France, Africa, Wisconsin), combine that with your surname.

+Adamec* +Utricularia*
+Haller* +hydrilla*
+Dutartre* +France

To Contribute Publications to APIRS Online

In exchange for free use of the database, users regularly contrib-ute reprints, reports and books to be cataloged and entered into the database. Many regional research centers around the world also contribute relevant publications. We rely on these contributions to maintain a comprehensive collection for you.

APIRS collects and catalogs journal articles, books, book chap-ters, agency reports and other published scientific literature. Send your published work as reprints, photocopies or PDF's to:

Ms. Karen Brown, APIRS

University of Florida-IFAS Center for Aquatic and Invasive Plants
7922 NW 71st Street, Gainesville, Florida 32653 - U.S.A.

E-mail: kpbrown@ufl.edu

APIRS was conceived of and developed by the late Mr. Victor Ramey. Ms. Karen Brown manages the database. Mrs. Mary Langeland catalogues all materials placed in the database. Ms. Lynda Dillon and Ms. Amy Tang add newly cataloged entries to the database.

APIRS Keywords

Any word may be used as a keyword, but this list represents keywords that are regularly and consistently used in the **APIRS** database.

- | | | |
|--|---------------------------------------|-------------------------------------|
| * acid (precipitation, rain, deposition) | * ethics | * natural areas management |
| * allelopathy | * ethnobotany | * new record |
| * annotated checklist (survey) | * exotic | * newspaper article/newsletter |
| Search query: +annotated +checklist | * exotic pest plant | * non-target |
| * aquarium | (FLEPPC* listed species) | * nursery |
| * aquascape | (*Florida Exotic Pest Plant Council) | * occurrence (plant distribution) |
| * artificial plants (plastic) | * extension | * paleobotany |
| * artificial (wetland) | * field guide | (alt. spelling: palaeobotany) |
| * autecology (relationship between one | * flood control | * philosophy |
| species and its environment) | * flooding | * phytochemistry (pharmacology, |
| * benthic barriers (bottom screens) | * flora | chemotaxonomy, allelopathy) |
| * benefits | * flow velocity | * phytogeography |
| * bioaccumulation | * food preference | * phytoplankton |
| * bioconcentration | * food web | * phytosociology (survey) |
| * biodiversity | * gas flow | * plankton |
| * biomanipulation | * genetics | * population studies |
| * biomass | * grazing | * preservation |
| * birds | * guides | * propagation |
| * book | * guidelines | * public information (extension) |
| * cd-rom | * habitat | * regulation |
| * chemical composition | * herbivory | * range |
| * choice tests (insect biocontrol) | * hobby | * reclamation |
| * commercial brochure | * horticulture | * radiolabel |
| * commercial uses (with utilization) | * host range (usually for biocontrol) | * redox |
| * communities | * host specificity or host range | * resource allocation (for nutrient |
| * conservation | (for insect biocontrol) | storage in plant tissue) |
| * created (wetland) | * human activities | * resource recovery |
| * crop | * human impacts | * restoration |
| * crowding (density) | * hydroelectric | * rodent |
| * competition | * hydrology | * salinity |
| * computer software | * identification | * salt |
| * constructed | * illustrations | * seagrasses |
| (wetland for pollution control) | * invasion | * sedimentation |
| * cost | * irrigation | * seed bank |
| * diet | * issues | * soil amendment |
| * density | * legislation | * spatial distribution |
| * depth accomodation | * literature review | * species composition |
| (elongation response) | * manuals | * species richness |
| * directory | * mating system | * stormwater |
| * dormancy | * medicine (use with utilizaton) | (for retention/detention ponds) |
| * drainage | * metals (heavy, uptake) | * tissue culture |
| * edible plants | * methane | * utility (electric) |
| * editorial | * method (if new, comparing | * value |
| * education | or challenging) | * video |
| * efficiencies | * micropropagation (tissue culture) | * wastewater |
| * effects | * minerals (uptake) | * waterfowl |
| * efficacy | * mitigation (created wetland) | * zooplankton |
| * epiphyte | * monitoring | |

MARY'S PICKS

Items of special interest from our reader/cataloger, Mary Langeland ~

* **Restoring the Garden of Eden: an ecological assessment of the marshes of Iraq.** By C.J. Richardson and N.A. Hussain. 2006. *BioScience* 56(6):477-489.

"These marshes were once the largest wetlands in southwest Asia and covered more than 15,000 square kilometers. . . less than 10% of the area remained as functioning marshland by the year 2000."

* **Shrinking papyrus swamps in Kenya.** Percy Fitzpatrick Institute, June/July 2005, p. 23. www.fitzpatrick.uct.ac.za

Papyrus (*Cyperus papyrus*) grows in flooded swamps in Africa and supports a "suite of specialist bird species." In East Africa, these include five restricted-range endemics: Papyrus yellow warbler (*Chloropeta gracilirostris*), White-winged warbler (*Bradypterus carpalis*), Papyrus gonolek (*Laniarius mufumbiri*) and Papyrus canary (*Serinus koliensis*). Two of these are listed as threatened. In Kenya, the three main swamp areas have lost 34 to 50 percent of their area over the past 30 years.

* **The weird, wild, wacky and wonderful world of carnivorous plants: an enrichment course for children ages seven through nine.** By T.A. Golembiewski. 2005. *Acta Botanica Gallica* 152(2):251-255.

A course on carnivorous plants is described that is offered annually at the University of Wisconsin-Whitewater as part of The Young Scholars program for primary school students.

* **E-commerce and *Caulerpa*: unregulated dispersal of invasive species.** By L.J. Walters, K.R. Brown, et al. 2006. *Frontiers in Ecology and the Environment* 4(2):75-79.

"We purchased *Caulerpa* from 30 internet retailers and 60 internet auction sites representing 25 states and Great Britain. Twelve different *Caulerpa* species were confirmed using DNA sequencing. Only 10.6% of sellers provided the correct genus and species names with their shipments. Thirty purchases of "live rock" provided four species of *Caulerpa*, as well as 53 additional marine species."

Tranquility?

NOT if you're an aquatic plant manager!!

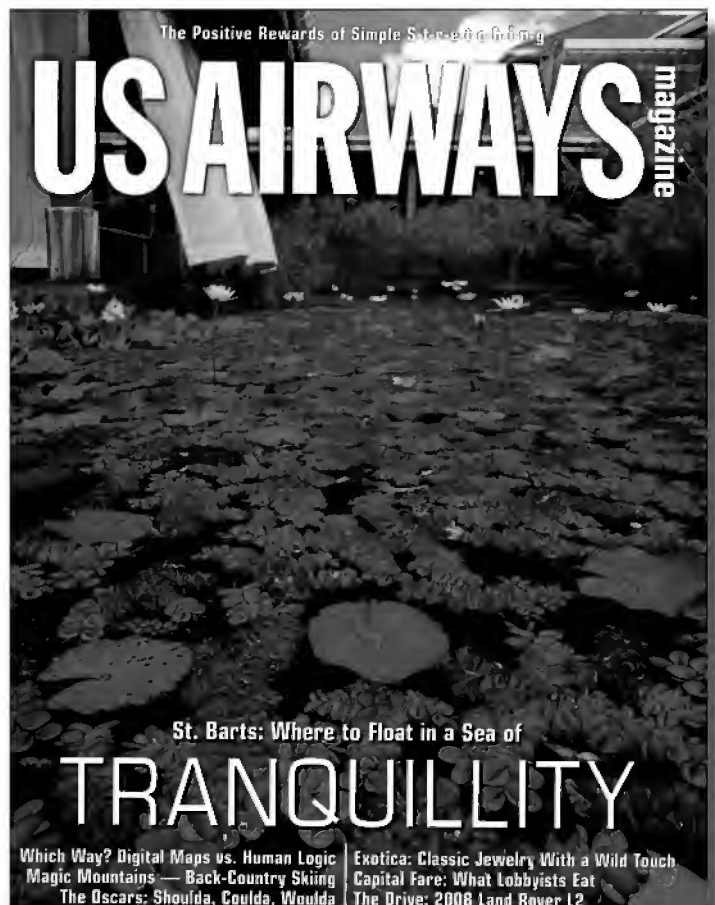
Pictured on the cover of this US Airways magazine is the infamous *Salvinia molesta*. The issue was discovered by Mr. Don Doggett of the Lee County Hyacinth Control District (Florida) as he was flying to the annual meeting of the Aquatic Plant Management Society in Portland, Oregon last year. Also in the photograph is another well-known aquatic weed, *Eichhornia crassipes*. Fortunately these invaders are enclosed in an ornamental pond on an island, and neither species can survive in salt water. But it is well known that aquatic weed infestation problems often begin when an attractive, conspicuous lavender flower and unknowing tourists are involved.

Eichhornia crassipes (water hyacinth) has long been cited as one of the ten worst weeds in the world. It wreaks havoc in the world's great rivers, irrigation and flood control canals, and reservoirs. A mat of medium-sized plants may contain as many as two million plants per hectare and the total wet weight may be 270 to 440 metric tons per hectare (Holm (1977)).

Salvinia molesta, a serious weed in approximately two dozen countries, is known to foul irrigation systems and navigable streams, interfere with electric power production, and threaten rice farming.

The hotel featured is the Hotel Guanahani and Spa, a posh resort in St. Barthelemy (St. Barts) in the French West Indies.

Holm, L.G., et al. The World's Worst Weeds, Distribution and Biology. 1977. University Press of Hawaii, Honolulu.



Eurasian Watermilfoil in Idaho

by William T. Haller, Acting Director,
UF/IFAS, Center for Aquatic and Invasive Plants

In April of 2006, the Idaho legislature allocated four million dollars per year for a three year effort towards eradication of Eurasian watermilfoil (EWM), *Myriophyllum spicatum*, in their freshwater systems. EWM was located primarily in the large lakes (reservoirs) of northern Idaho and in many small lakes in the southwest, near Boise. The funding program was directed by the Idaho State Department of Agriculture (ISDA), which utilized lake associations, county noxious weed programs, cooperative weed management associations, and Native American tribes, as contracting authorities to conduct the effort. By the summer of 2006, hand removal, benthic barriers and herbicides, as well as educational programs, were all being utilized to reduce EWM populations in the state.

In November 2006, a peer review panel was established to evaluate and make programmatic recommendations to the ISDA to streamline the program and make it more efficient. The panel was chaired by Dr. Joe Joyce, former U.S. Army Corps of Engineers, Director of Weed Control Operations for the Jacksonville District, and currently Executive Associate Vice President for Agriculture and Natural Resources at UF/IFAS. Panel members also included Dr. Ken Langeland, UF/IFAS, Dr. Robert Leavitt, California Department of Food and Agriculture, Mr. Chip Wellington, Minnesota Department of Natural Resources, and Mr. Jeff Schardt, Florida Department of Environmental Protection. The panel convened November 12-16, 2006 in Boise, Idaho, and met with numerous state agency personnel and county noxious weed superintendents, as well as many stakeholders, in order to review the eradication efforts. The full report is available at <http://www.idahoag.us/Categories/PlantsInsects/NoxiousWeeds/milfoil.php>

The panel was complimentary of the 2006 eradication program, a monumental effort to establish a program where none had existed in order to treat EWM in the summer of 2006. The panel discussed eradication at length, recognizing that there is no effort to control EWM in many waterways in eastern Washington state, a close source of plants for reinfestation. The conclusion was to eradicate EWM in counties with small infestations where eradication is possible, and to control EWM around boat ramps and in high use areas in large reservoirs (where eradication is less likely) to minimize movement into nearby waters. The panel also recognized the ISDA as the lead agency, and endorsed the county based weed management agencies as primary operational entities. Following this initial three year effort, additional recurring funding should be sought to maintain the effort against not only EWM, but other potentially invasive aquatic weeds. Additional staffing was deemed necessary to represent north, central and southern Idaho in program coordination, mapping, surveying and evaluation of contractor performance.

Most invasive weed management programs identify a problem, followed by many years of cajoling agency heads and legislators to provide funds for control. For example, for many years



Eurasian watermilfoil (*Myriophyllum spicatum*)
infestation, Lake Pend Oreille, Idaho.

Photo by Scott Culpepper

Florida biologists recognized melaleuca (*Melaleuca quinquenervia*) as a significant and expanding problem in south Florida. Finally in about 1990, funds were allocated and 15-17 years later, melaleuca is under control in most areas and eradicated from many sites. In Idaho, funding was provided by an informed legislature, which is being followed by program development and new proposed legislation to reduce the risk of naturalization of additional species and provide greater vigilance in natural and aquatic areas.

In the southeastern U.S., Florida in particular, we have new invasive pests found on a regular basis. There are certainly many invasive weeds in Idaho (cheatgrass (*Bromus tectorum*) and Russian olive (*Elaeagnus angustifolia*)) that are very common and very serious, but aquatic ecosystems in Idaho only contain the aquatic weeds EWM and curly-leaf pondweed (*Potamogeton crispus*), with a huge diversity of native species. Hopefully the state of Idaho, with a program and personnel in place, can protect their aquatic systems from further invasive aquatic plants.

FROM THE DATABASE

This is a sampling of the research articles, books and reports which have been entered into the aquatic, wetland and invasive plant database since Fall 2006. The APIRS database contains more than 67,000 citations. To use the free database online, go to <http://plants.ifas.ufl.edu/> and click on APIRS Online Database.

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International Aquatic Plant Enthusiasts Gather in Thailand

by Paula Biles

The annual **Symposium of the International Waterlily & Water Gardening Society (IWGS)** convened in Asia for the first time in the Society's 23 year history. The July 2007 meeting's activities spanned seven days and was attended by scholars, hybridizers, retailers, botanical garden directors, growers, and hobbyists from 14 countries.

Several Thai agencies co-hosted the Symposium, which was considered part of the national celebration to honor the 80th birthday of King Bhumibol Adulyadej. Our hosts included Kasetsart University, King Rama IX Public Park, the Thailand Agricultural Science Foundation, and Queen Sirikit Botanic Gardens. They pulled out all the stops to showcase the aquatic plant side of the country, as well as to show attendees a good time while exposing us to fascinating non-botanical things. A perfect example of our royal treatment was that their beloved Thai Princess Chulabhorn Walailuk attended the opening ceremony.

As is customary with the IWGS, the Symposium was composed of excursions to botanical gardens, visits to aquatic plant growers, behind the scenes looks at places of interest, and a full day of educational presentations. It goes without saying that everything took on a completely different flavor since Thailand is known for its hospitality and most attendees had never been there before. We got to experience several non-customary events, beginning with a "Welcome IWGS" banner carried in by elephants.

We visited both Chiang Mai and Bangkok, where we learned how Thais include aquatic plants into their daily life. Everywhere we went and whatever we did, water plants were visible. It seemed that all aspects of the Thai society (food, agriculture, commerce, decoration, clothing, and religion) included at least an aquatic plant or two. Even the median strips in hectic Bangkok were planted with several varieties of cannas and occasional pots of water lilies.

One memorable activity was a visit to Bangkok's weekly plant market. It was astounding to see the number and variety of aquatics amid the countless other plants offered in the small crowded stalls. Since aquatic plants are so popular in Thailand, it was possible to buy flowers, plants, fertilizer, containers, seeds, tubers, and soil. There were even small plants of the giant *Victoria amazonica* for sale, many of them in flower. Lotuses and water lilies were most common, with some identified by name (occasionally in English) but more often by blossom photograph. Prices were incredibly low.

Unexpected surprises were the pervasive use of containers instead of ponds and the great popularity of water garden displays. It seemed that almost every home, business (large and small), and temple (grandiose and informal) had at least one water feature. There would be a beautifully decorated pot filled with water lilies...or a small fountain with a little moving water...or a sculptured container filled with large dramatic lotuses. This was the case in busy Bangkok as well as laid back Chiang Mai.

It seemed that lotuses were everywhere – as plants, food, temple offerings, symbolic art, and decoration on items in everyday life. Throughout the Symposium we learned a great deal about numerous aquatic plants, predominantly tropicals. However, since the lotus is such a revered and practical plant, many of the educational seminars and poster sessions dealt with it. Some of the many *Nelumbo* topics included: an ethnobotanical study in Thailand, development in China, use as a multipurpose crop in the US southeast, and effects of gamma radiation on growth.



Photo by Paula Biles



Photo by Paula Biles

Speakers for the seminars included an impressive array of international experts. The keynote presenters were Richard Sacher (US), Andre Leu (Australia), Huang Guozhen (China), Deni Bown (UK), Wang Qichao (China), Dr. Slearnlarp Wasuwat (Thailand), and Dr. Narong Chomchalow (Thailand).

Of course, having such a multinational pool of aquatic plant experts generated an energy that was almost tangible. It was as if chemical reactions were created by the strong presence of knowledge, enthusiasm, respect, and desire for learning about aquatics. The force-field generated from all the animated discussions was amazing and a joy to experience.

Most folks always carried notebooks and digital cameras to record the experience and to keep track of plants, growing tips, display ideas, contact info, and other valuable information. They didn't want to forget anything that could be used in their botanical garden, retail center, growing ponds, or backyard water garden. They were excited about being able to expand their knowledge base and did whatever they could to maximize the experience. Some took more than 2000 photos.

Much of the information shared (especially the practical tips and plant recommendations) would be impossible to find in books or online. That is why the value of face-to-face networking has not diminished, even in our digital age. It's the reason why these experts traveled around the world -- to meet, talk, and learn from colleagues. So many will consider the networking as the most valuable portion of this truly remarkable Symposium.

Next year's Symposium will be in Virginia in mid-July. Check www.iwgs.org for more details, as well as information on the Society, Symposium pictures, research grants, and other activities. Aquaphyte readers are all invited to Virginia.

The IWGS is an organization of international membership dedicated to the furtherance of all aspects of water gardens and their associated plants. Since 1984 the IWGS has supported and promoted education, research, and conservation in these areas. (They are the ISHS appointed international Registrar of *Nelumbo* and *Nymphaea*.)

MEETINGS

31st Annual Florida Aquatic Plant Management Society (FAPMS) Training Conference, October 1-4, 2007, St. Petersburg, Florida. www.fapms.org

Right-of-Way & Aquatic Pesticide Applicator Training, University of Florida-IFAS, October 16-18, 2007, Panama City Beach, Florida. Continuing Education Units (CEUs) available for Alabama, Florida, Georgia, Louisiana, Mississippi. <http://conference.ifas.ufl.edu/applicator>

34th Annual Conference on Ecosystems Restoration and Creation, Hillsborough Community College, November 1-2, 2007, Plant City, Florida. <http://www.hccfl.edu/depts/detp/ecoconf.html>

27th International Symposium of the North American Lake Management Society (NALMS), hosted by the Florida Lake Management Society, "Understanding the Science of Lake Management," Oct 30-Nov. 2, 2007, Orlando, Florida. <http://www.nalms.org> or <http://flms.net/>

2008 Aquatic Weed Control Short Course, University of Florida-IFAS, Aquatic, Upland and Invasive Weed Control; Aquatic Plant Identification, May 4-8, 2008, Coral Springs, Florida. <http://conference.ifas.ufl.edu/>

5th International Weed Science Congress, June 23-27, 2008, Vancouver, Canada. <http://iws.ucdavis.edu/5intlweedcong.htm>. Will include an Aquatic Weed Management component. Contact: Mike Netherland, USA | mdnether@ufl.edu; Kevin Murphy, UK | k.murphy@bio.gla.ac.uk

University of Florida
Institute of Food and Agricultural Sciences
Center for Aquatic and Invasive Plants (CAIP)
Aquatic, Wetland and Invasive Plant
Information Retrieval System (APIRS)
7922 N.W. 71st Street
Gainesville, Florida 32653-3071 USA
(352) 392-1799 FAX: (352) 392-3462
CAIP-website@ufl.edu
<http://plants.ifas.ufl.edu>

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AQUAPHYTE

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EDITOR: Karen Brown

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Inclusion in **AQUAPHYTE** does not constitute endorsement, nor does exclusion represent criticism, of any item, organization, individual, or institution by the University of Florida.

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Photo by Dan Safford, ISDA.

Parrot feather in Idaho Waters

Thomas Woolf, Aquatic Plants Program Manager at the Idaho State Department of Agriculture (ISDA) displays a clump of parrot feather (*Myriophyllum aquaticum*), which is infesting the water body behind him near Emmett, Idaho. The pond is approximately 3 acres with a maximum depth of about 10 feet. 90% of the surface of the pond and the associated canal system are covered. The ponds and canals are fed by warm springs that allow these aquatic weeds to flourish.